CVD Tantalum compounds for FET gate electrodes

ABSTRACT OF THE INVENTION

Compounds of Ta and N, potentially including further elements, and with a resistivity below about 20mΩcm and with the elemental ratio of N to Ta greater than about 0.9 are disclosed for use as gate materials in field effect devices. A representative embodiment of such compounds, TaSiN, is stable at typical CMOS processing temperatures on SiO_2 containing dielectric layers and high-k dielectric layers, with a workfunction close to that of n-type Si. Metallic Ta - N compounds are deposited by a chemical vapor deposition method using an alkylimidotris(dialkylamido)Ta species, such as tertiaryamylimidotris(dimethylamido)Ta (TAIMATA), as Ta precursor. The deposition is conformal allowing for flexible introduction of the Ta-N metallic compounds into a CMOS processing flow. Devices processed with TaN or TaSiN show near ideal characteristics.